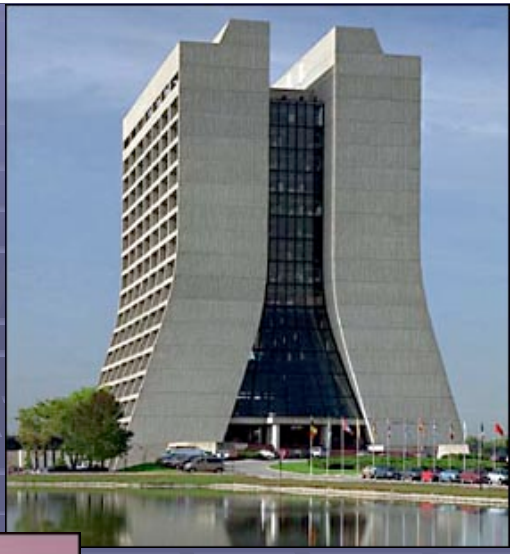
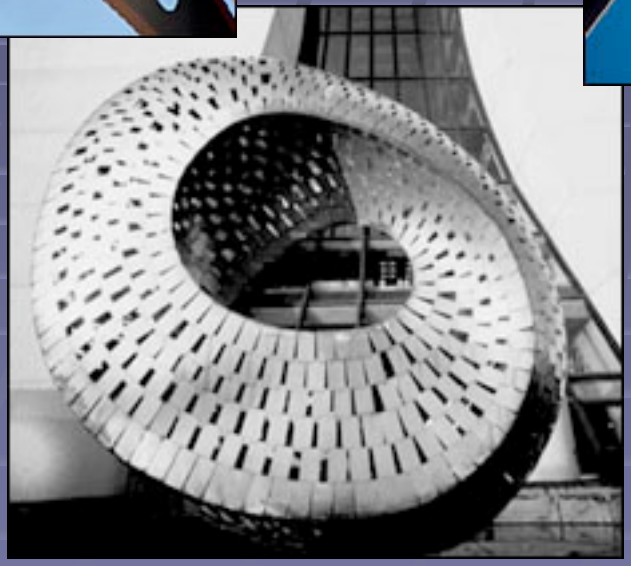
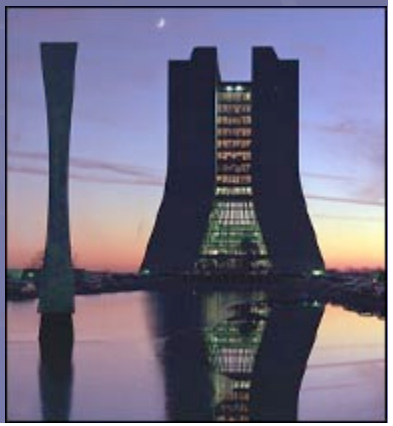

RICE
UNIVERSITY





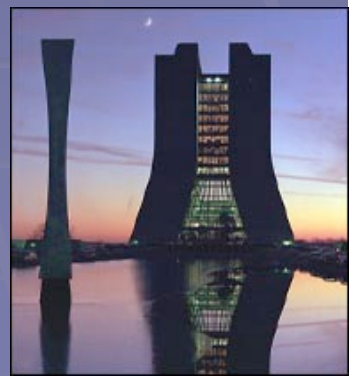


Fermilab

about Fermilab

The Future of American Science -to Follow or to Lead?

Fermi National Accelerator Laboratory
May 24, 2006
neal lane



The Future of American Science –to Follow or to Lead?

Fermi National Accelerator Laboratory
May 24, 2006
neal lane

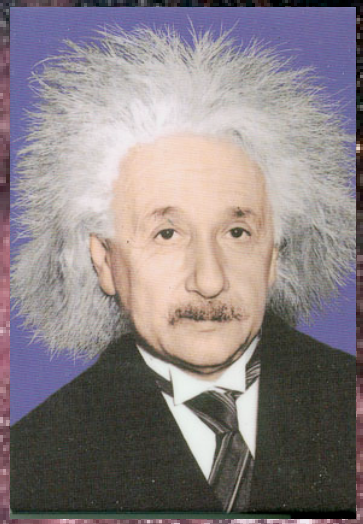
OUTLINE

- A personal journey
- U.S. science and technology
- A few policy concerns
- What lies ahead?

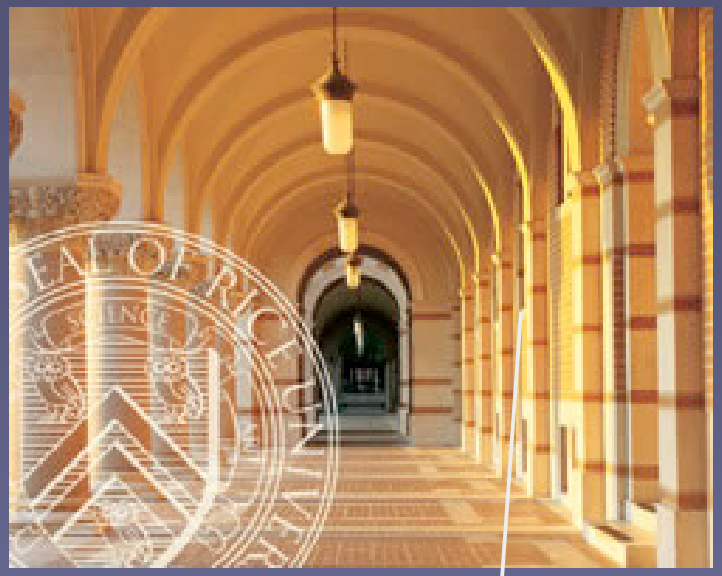

ADWAY CLASSICS
BROADWAY
Angel
Rodgers and Hammerstein's
Oklahoma!

"2005- the year of physics"

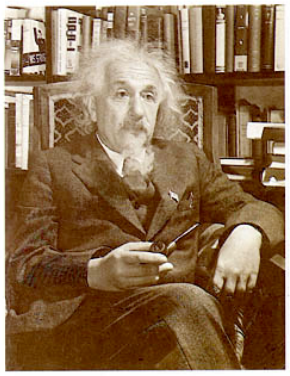
$E = Mc^2$



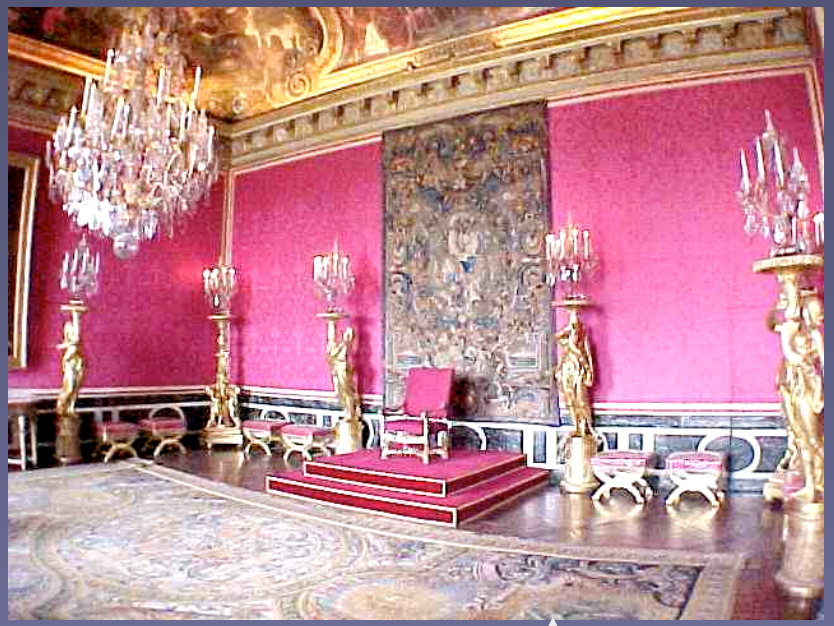
Rice University

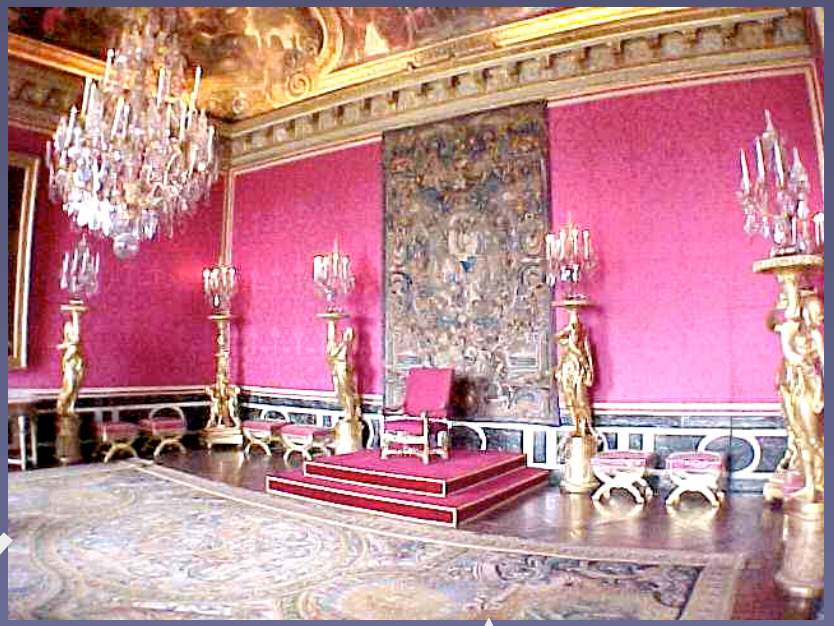


Physics office



Provost's office





Washington D.C.

The Executive Branch Of the U.S. Government

with R&D agencies

U.S. President

Two different jobs in Washington

Office of Management and Budget

Science Advisor
Office of Science and Technology Policy

NSTC

Other boards, councils, etc.

Major Departments

- Agriculture
- Health and Human Services
  - NIH
- Interior
  - USGS
- Transportation
- Homeland Security
- Defense
  - DARPA, ONR, AFOSR
- Energy
  - NNSA
- Commerce
  - NOAA
  - NIST

Independent Agencies

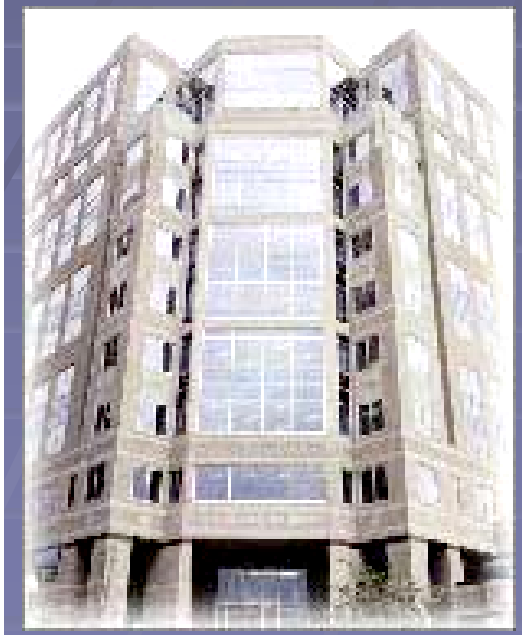
- NSF
- National Aeronautic and Space Administration
- Environmental Protection Agency
- Smithsonian Institution
- Nuclear Regulatory Commission
- Other agencies

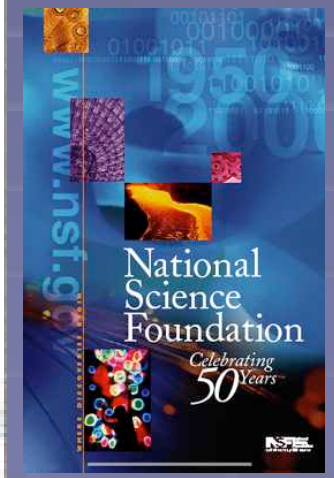
National Science Foundation

WHERE DISCOVERIES BEGIN

Founded 1950

NSF spends $ 6 billion on research and education !



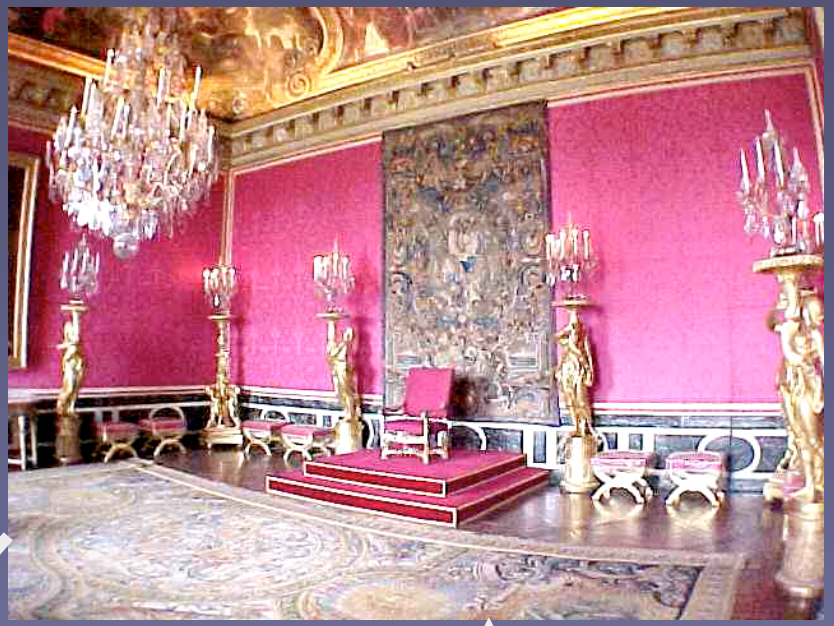


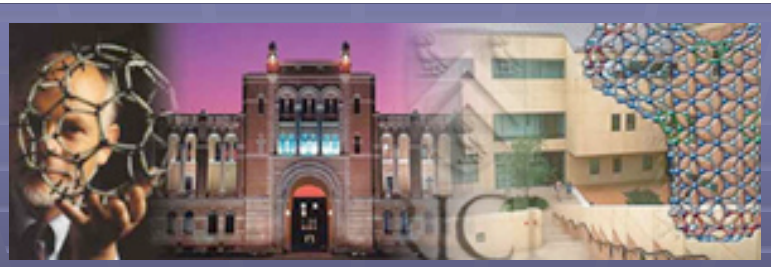
Budget	$ 6 billion
Proposals	30,000
Awards	19,000 (10,000 new)
Institutions	2,000
Staff	1,400
Reviewers	50,000

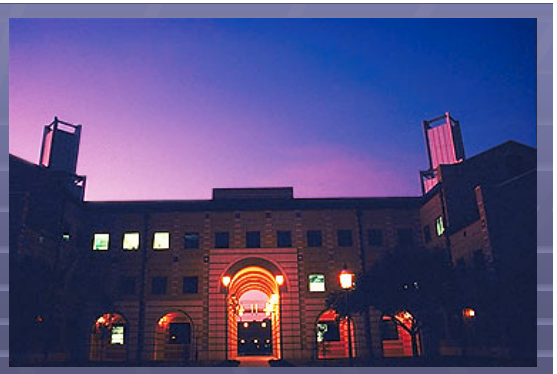

President's parking place
Oval Office
Neal's parking place

"Neal, how much do we need for science?"

Happily back at Rice

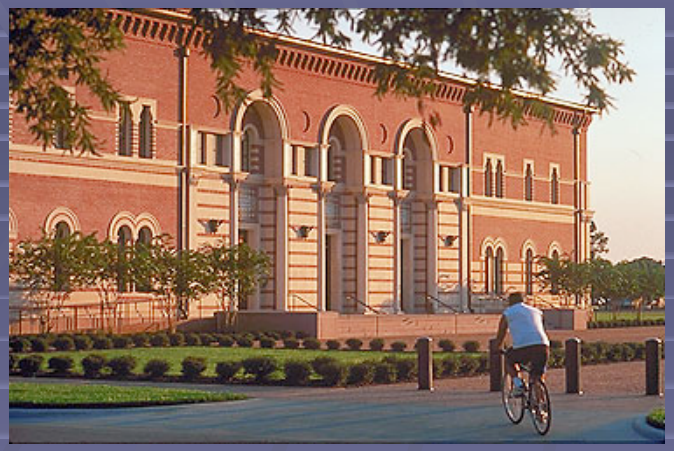







RICE
UNIVERSITY

JAMES A. BAKER III INSTITUTE FOR PUBLIC POLICY AT RICE UNIVERSITY

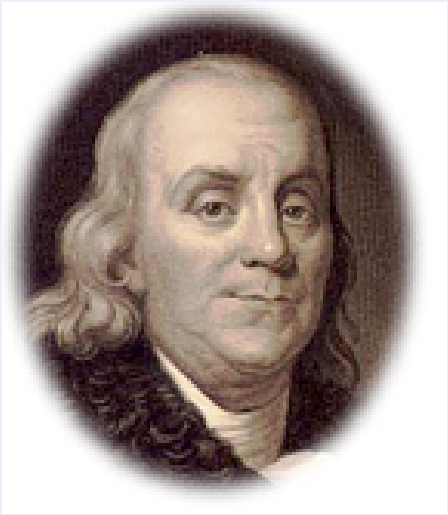


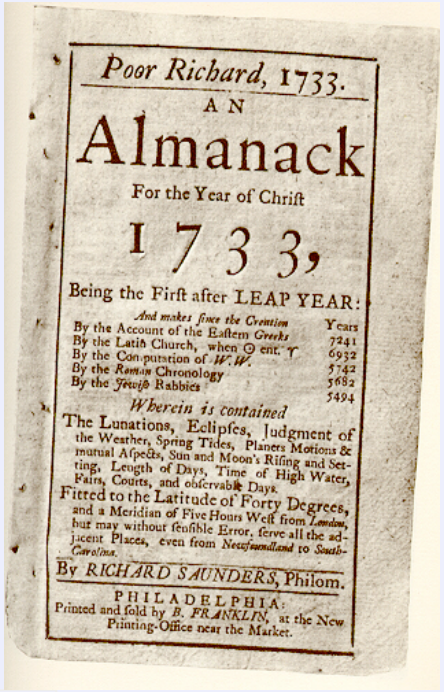
Science and Technology Policy Program
(coordinated by Dr. Kirstin Matthews)

- Energy and Environment (w/ Amy Jaffe)
- Health and Medicine (w/ TMC inst's)
- Space (w/ George Abbey)
- Nuclear Issues/ Non-Proliferation
- Education and Women in Science
- Scientists and the Public
- The Future of U.S. Science

OUTLINE

- A personal journey
- **U.S. science and technology**
- A few policy concerns
- What lies ahead?





Poor Richard, 1733.

AN

Almanack

For the Year of Chriſt

1733,

Being the Firſt after LEAP YEAR:

And makes ſince the Creation

	Years
By the Account of the Eaſtern *Greeks*	7241
By the Latin Church, when ♎ ent. ♈	6932
By the Computation of *W. W.*	5742
By the *Roman* Chronology	5682
By the *Jewiſh* Rabbies	5494

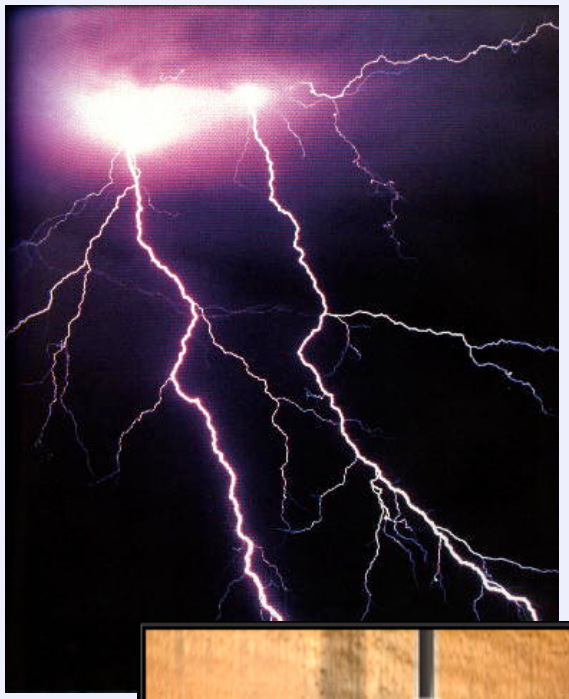
Wherein is contained

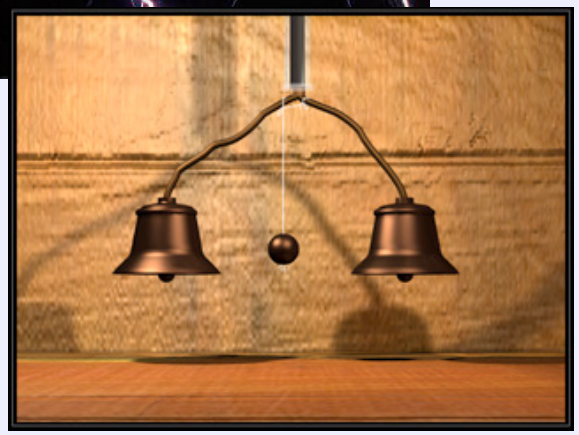
The Lunations, Eclipſes, Judgment of the Weather, Spring Tides, Planets Motions & mutual Aſpects, Sun and Moon's Riſing and Setting, Length of Days, Time of High Water, Fairs, Courts, and obſervable Days.

Fitted to the Latitude of Forty Degrees, and a Meridian of Five Hours Weſt from *London*, but may without ſenſible Error, ſerve all the adjacent Places, even from *Newfoundland* to *South-Carolina*.

By *RICHARD SAUNDERS*, Philom.

PHILADELPHIA:
Printed and ſold by *B. FRANKLIN*, at the New Printing-Office near the Market.



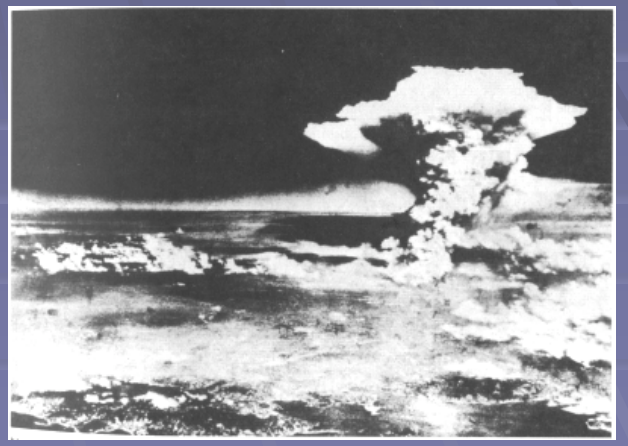


Benjamin Franklin
American
"civic scientist"
1706-1790

World War II and the Manhattan Project

Stagg Field

Chicago Pile - 1
December 2, 1942

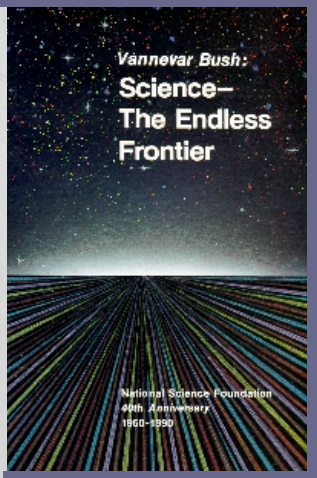


Hiroshima
6 August 1945 8:15 AM

Science in Cold War

Vannevar Bush and the Partnership



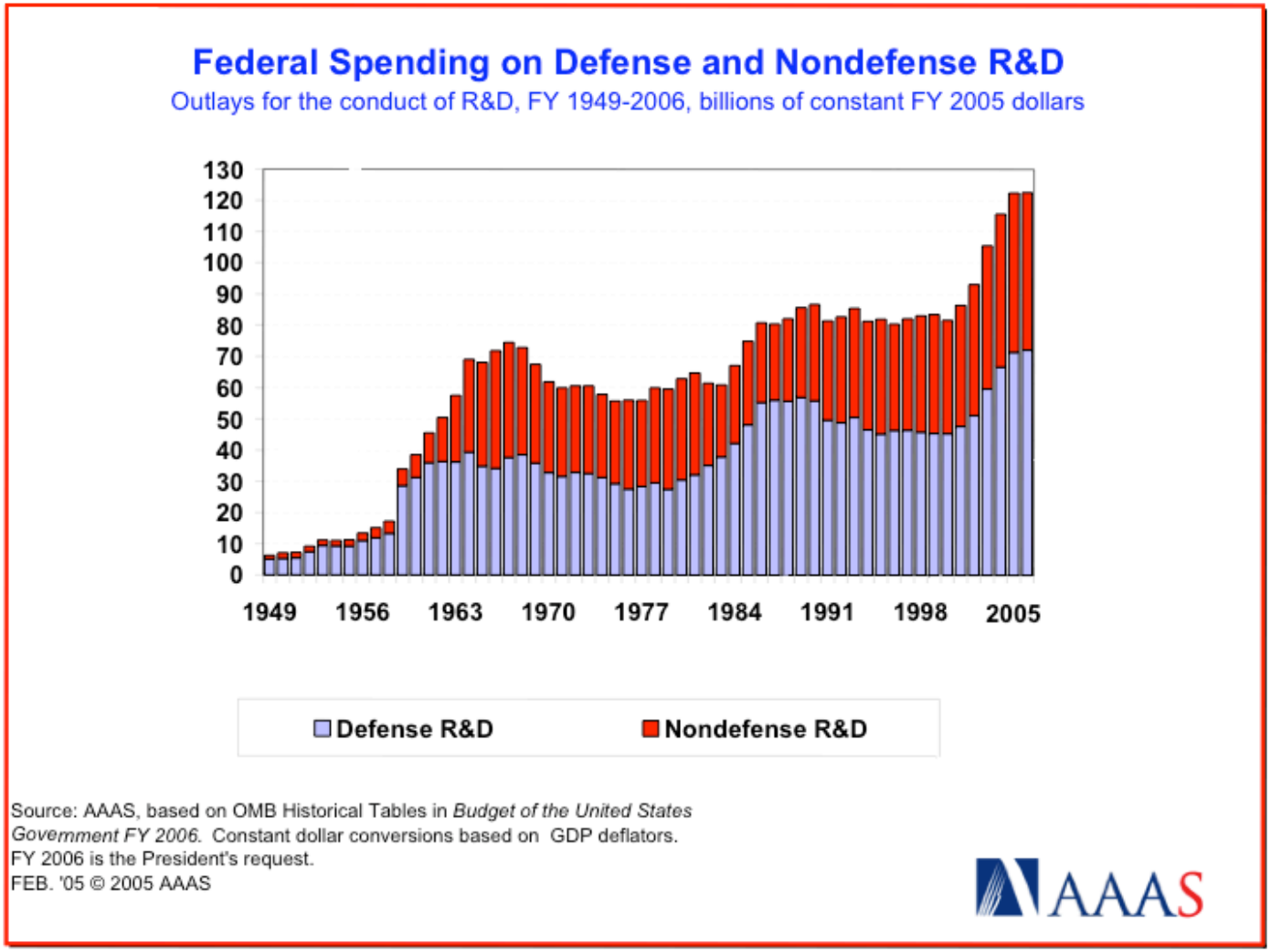



Vannevar Bush's "Science: The Endless Frontier:"

"The Government should accept new responsibilities for promoting the flow of new scientific knowledge and the development of scientific talent in our youth. These responsibilities are the proper concern of the Government, for they vitally affect our health, our jobs and our national security."

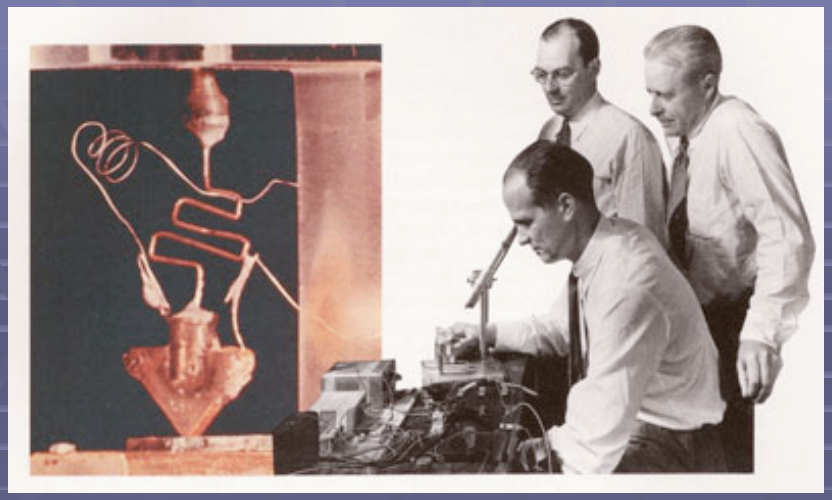
NSF established in 1950

60 Years of Federal R&D Funding

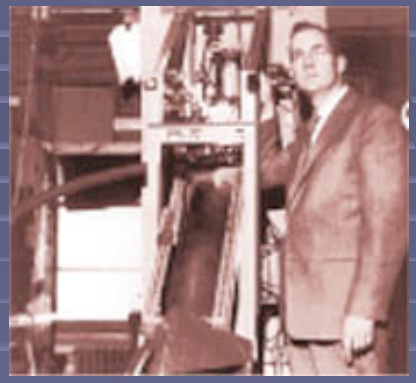


Science in Cold War

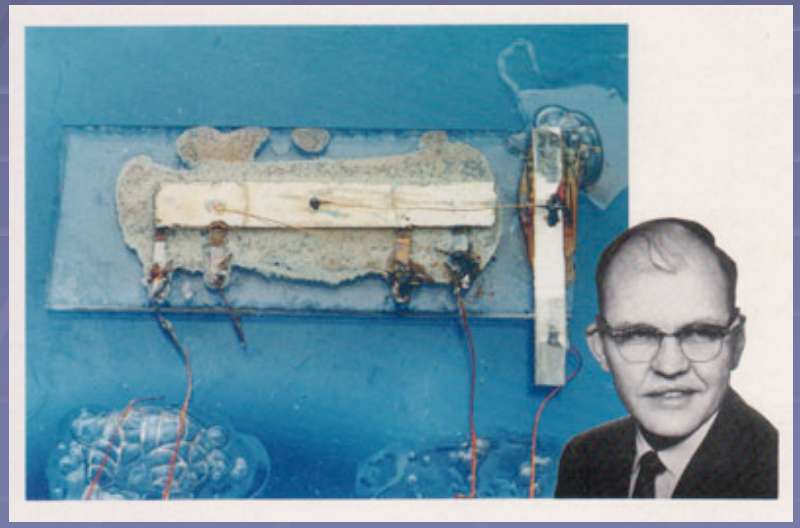
a few inventions !



Transistor, 1947



Maser , 1953-54



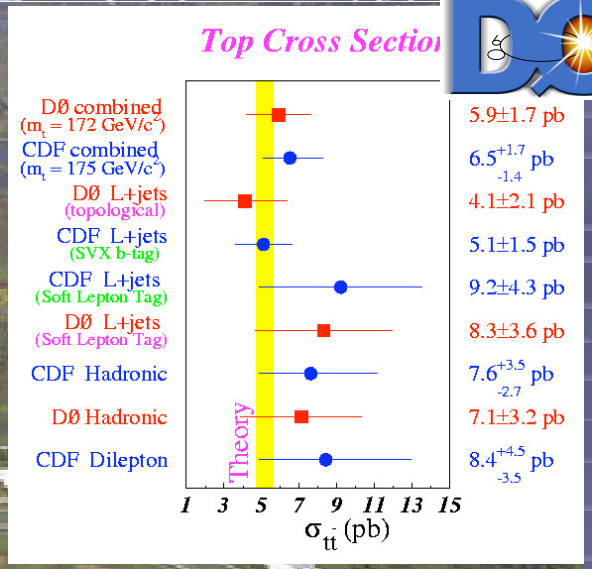
Integrated Circuit, 1958

Laser, 1958-1960

Fermilab

about Fermilab

THE COLLIDER DETECTOR AT FERMILAB



CMS

LARP

SDSS

Main Injector Neutrino Oscillation Search

BooNE

The Executive Branch Of the U.S. Government

with R&D agencies

U.S. President

Office of Management and Budget

Science Advisor
Office of Science and Technology Policy

NSTC

Other boards, councils, etc.

Major Departments

Homeland Security

Agriculture

Health and Human Services
NIH

Interior
USGS

Transportation

Defense
DARPA, ONR, AFOSR

Energy
NNSA

Commerce
NOAA
NIST

Independent Agencies

National Aeronautic and Space Administration

Environmental Protection Agency

Smithsonian Institution

Nuclear Regulatory Commission

Other agencies

The Executive Branch Of the U.S. Government

with R&D agencies

U.S. President

Science and Technology are important to most Federal Agencies

Office of Management and Budget

Science Advisor
Office of Science and Technology Policy

NSTC

Other boards, councils, etc.

Major Departments

- Agriculture
- Health and Human Services
  - NIH
- Interior
  - USGS
- Transportation
- Homeland Security
- Defense
  - DARPA, ONR, AFOSR
- Energy
  - NNSA
- Commerce
  - NOAA
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- National Aeronautic and Space Administration
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- Nuclear Regulatory Commission
- Other agencies

The Executive Branch Of the U.S. Government

with R&D agencies

U.S. President

Science and Technology are important to most Federal Agencies

One job of the Science Advisor is to coordinate S&T activities across federal government

Office of Management and Budget

Science Advisor
Office of Science and Technology Policy

NSTC

Other councils, etc.

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Homeland Security

Agriculture

Health and Human Services
NIH

Interior
USGS

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NNSA

Commerce
NOAA
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Environmental Protection Agency

Smithsonian Institution

Nuclear Regulatory Commission

Other agencies

Examples of Public Policy Issues that Relate to Science and Technology

- Advances in science, engineering, and technology (R&D budget)
- Emerging technologies - National Nanotechnology Initiative
- Energy production and consumption
- National and Homeland security and counter-terrorism
- Environment – air/water, climate change, clean-up
- Storage of spent nuclear fuel and high level radioactive waste
- Information technology, computing, internet
- Health – Human genome, proteomics, cloning, stem cells, AIDS
- International cooperation in S&T (e,g, Carnegie G-8 meetings)
- Education and the technical workforce
- Space program
- Food safety, plant biotechnology (GMO's)
- Policy on research misconduct
- Surprises !

Physicists Advising Government on Science and Technology

Pres. Eisenhower's PSAC (Dec. 1960)

Recent President's Science Advisors

Federal agencies have two "masters"

President

OSTP

OMB

Congress

Appropriations Subcommittees

$

$

NASA,NIH, NSF, DOE and other agencies

Federal agencies have two "masters"

and plenty of advice

President

OSTP

OMB

Congress

National Academies
(NAS/NAE/IOM)

Appropriations
Subcommittees

Expert
testimony

PCAST

$

$

NASA,NIH, NSF, DOE
and other agencies

Expert
Advisory
Committees

Federal agencies have two "masters"

and plenty of advice – and **pressure!**

Special Interests

Media

President

Media

Congress

National Academies (NAS/NAE/IOM)

OSTP

OMB

Appropriations Subcommittees

Lobbyists

Expert testimony

PCAST

Media

$

$

Disciplines

Industry

Special Interests

Consumers

NASA,NIH, NSF, DOE and other agencies

Expert Advisory Committees

Federal agencies have two "masters"

and plenty of advice – and **pressure!**

Special Interests

Media

President

Media

Congress

National Academies (NAS/NAE/IOM)

OSTP

OMB

Appropriations Subcommittees

Lobbyists

Expert testimony

PCAST

Media

$

$

Disciplines

Industry

Special Interests

Consumers

NASA,NIH, NSF, DOE and other agencies

Expert Advisory Committees

Agencies erect barricades to "protect and defend"

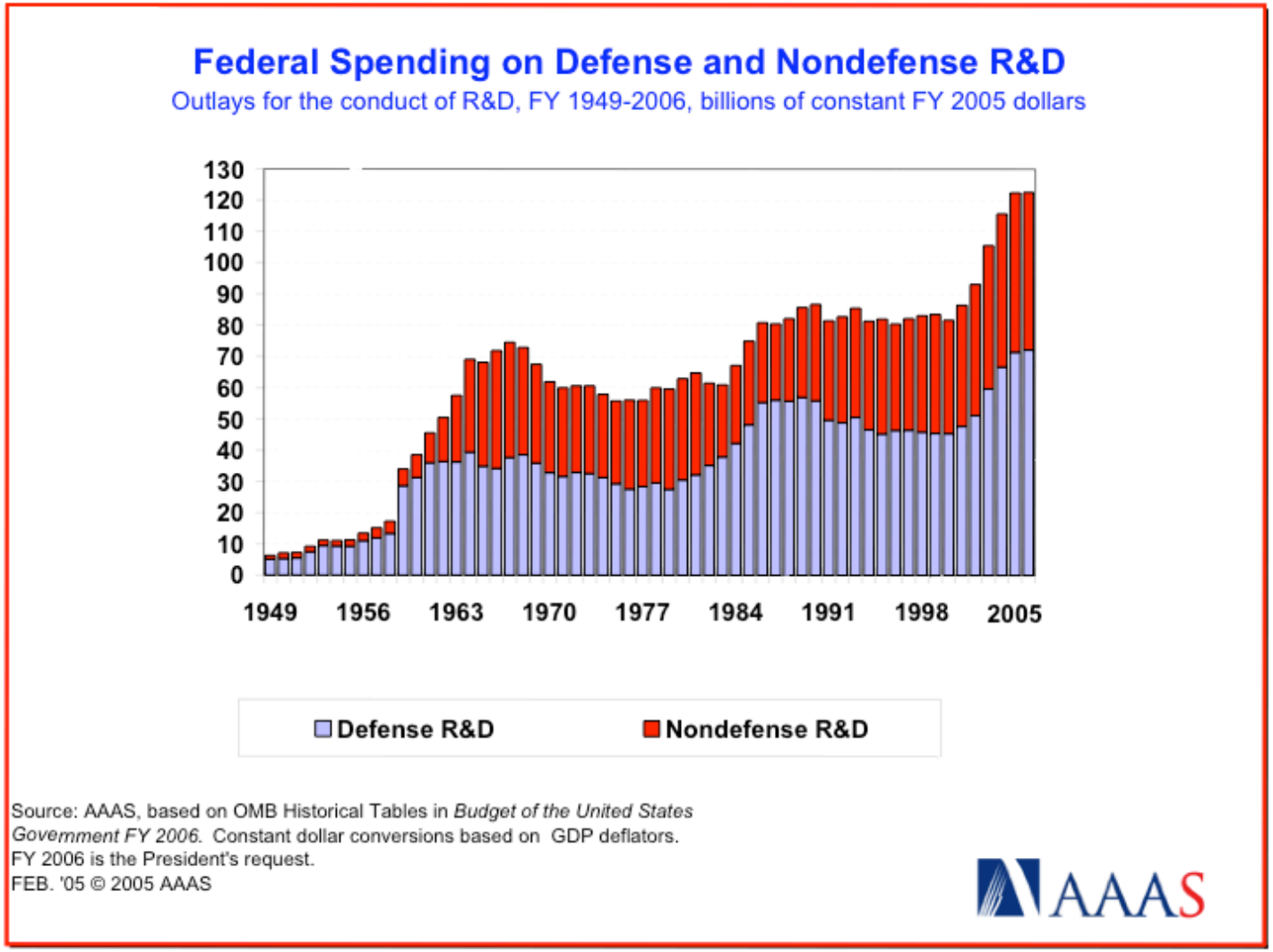
OUTLINE

- A personal journey
- U.S. science and technology
- **A few policy concerns**
- What lies ahead?

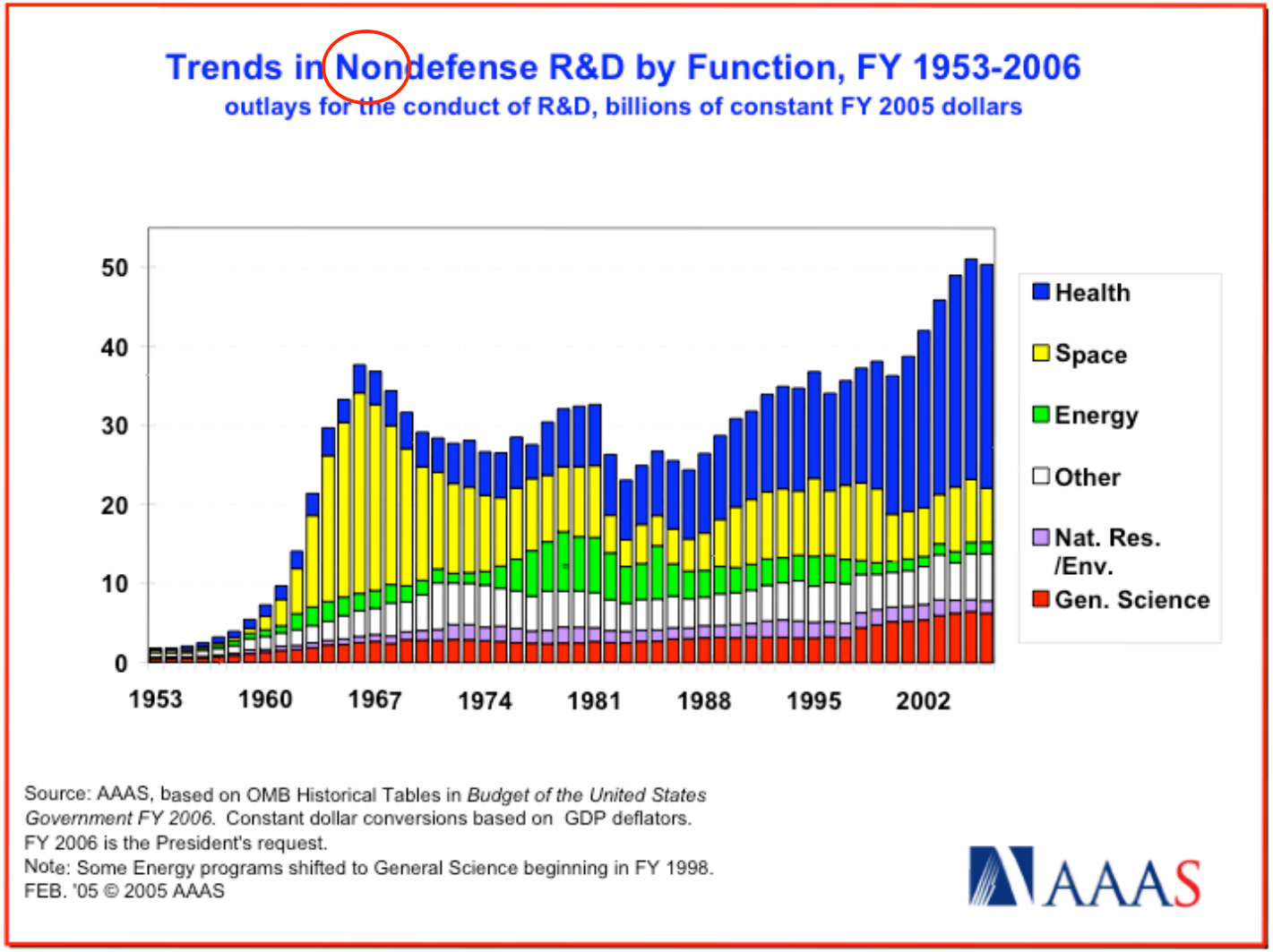
THREE THREATS TO U.S. SCIENCE IN THE FUTURE –ALL OF WHICH ARE 'POLITICAL'

- MONEY TO FUND SCIENCE
- PEOPLE TO DO SCIENCE
- PUBLIC UNDERSTANDING AND TRUST IN SCIENCE

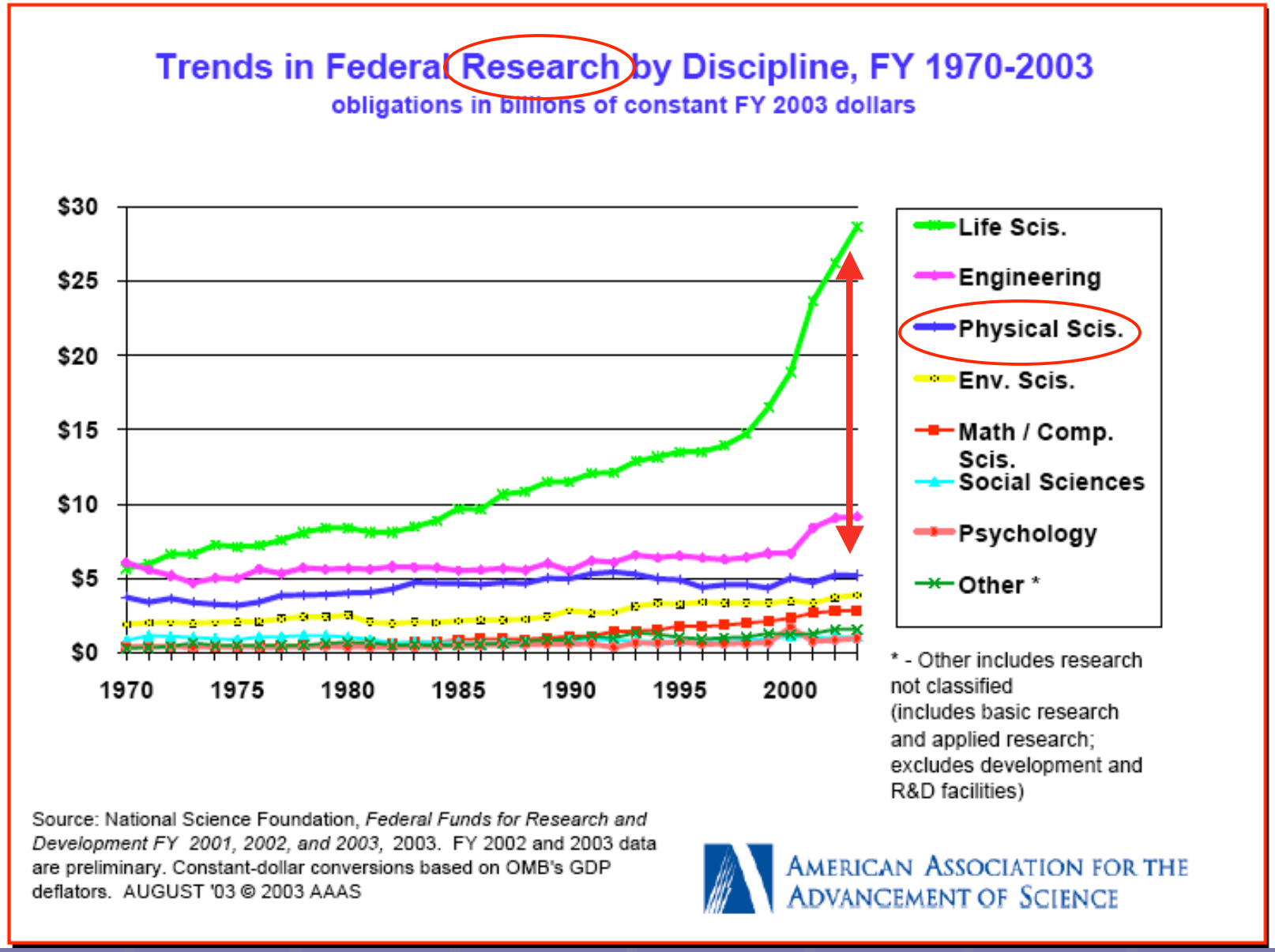
60 Years of Federal R&D Funding



From the age of Space to the age of Medicine



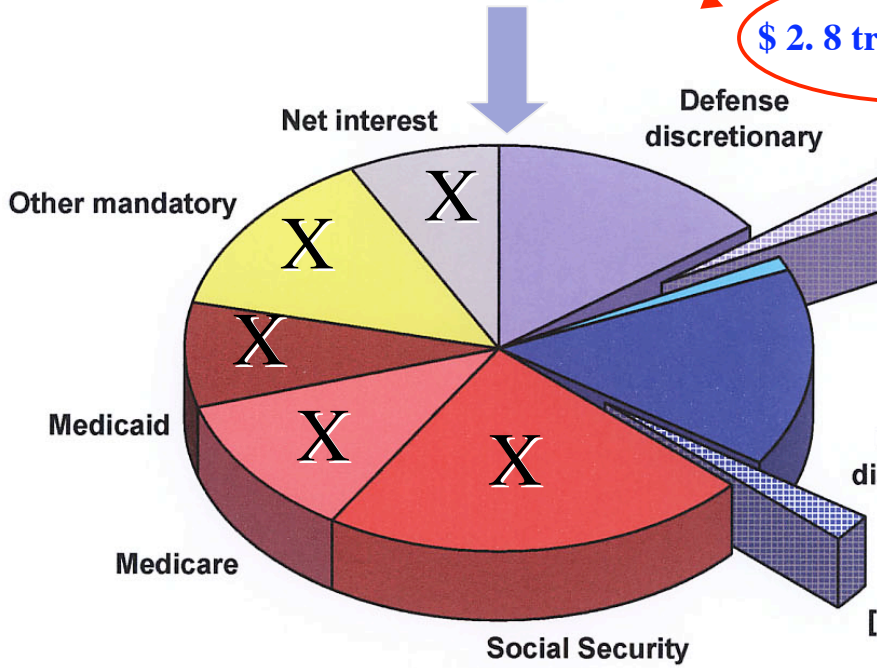
The Growing "Physical Sciences Gap" in Funding



Research is a small part of discretionary spending –it will continue to get squeezed !

Composition of the Proposed FY 2004 Budget
Total Outlays = $2,229 billion

$ 2. 8 trillion in FY07



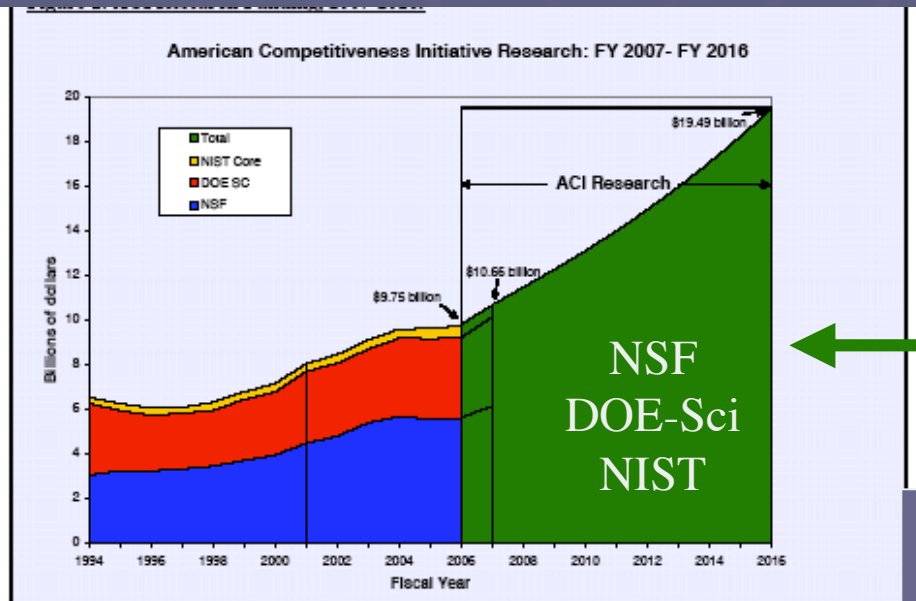
$ 74 billion FY2007

$ 63 billion FY2007

Note: Projected Unified deficit is $307 billion.
Source: AAAS, based on *Budget of the United States Government FY 2004.*
FEB. '03 © 2003 AAAS

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

The President has requested significant increases in FY2007 for NSF, DOE Science, and NIST



	FY 2006 Funding	ACI Research FY 2007		ACI Research FY 2016	
	(billions of dollars)	(billions of dollars)	% increase	(billions of dollars)	% increase over FY06
NSF	$5.58	$6.02	7.8	$11.16[1]	100.0
DoE SC	$3.60	$4.10	14.0	$7.19[1]	100.0
NIST Core[2]	$0.57[3]	$0.54	-5.8[4]	$1.14[1]	100.0
TOTAL	$9.75	$10.66	9.3	$19.49	100.0

[1] ACI doubles total research fund; individual agency allocations remain to be determined.
[2] NIST core consists of NIST lab research and construction accounts.
[3] The 2006 enacted level for NIST core includes $137 million in earmarks.
[4] Represents a 24 percent increase after accounting for earmarks.

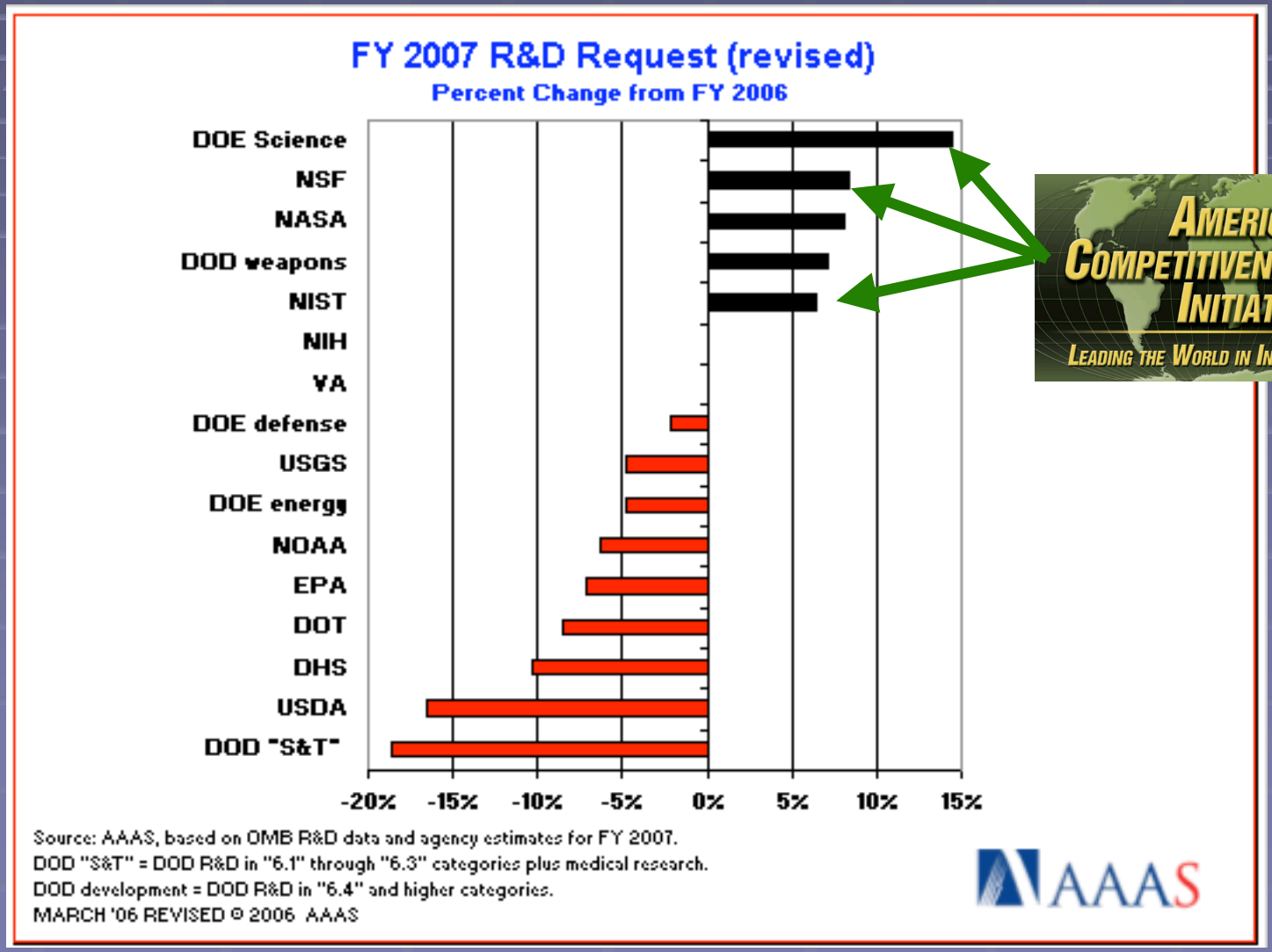
ACI RESEARCH AGENCIES

NSF
DOE-Sci
NIST

Buzz Words

- Innovation
- Competitiveness
- Energy independence

But the President has cut many science programs and other popular discretionary spending –it is not over yet!

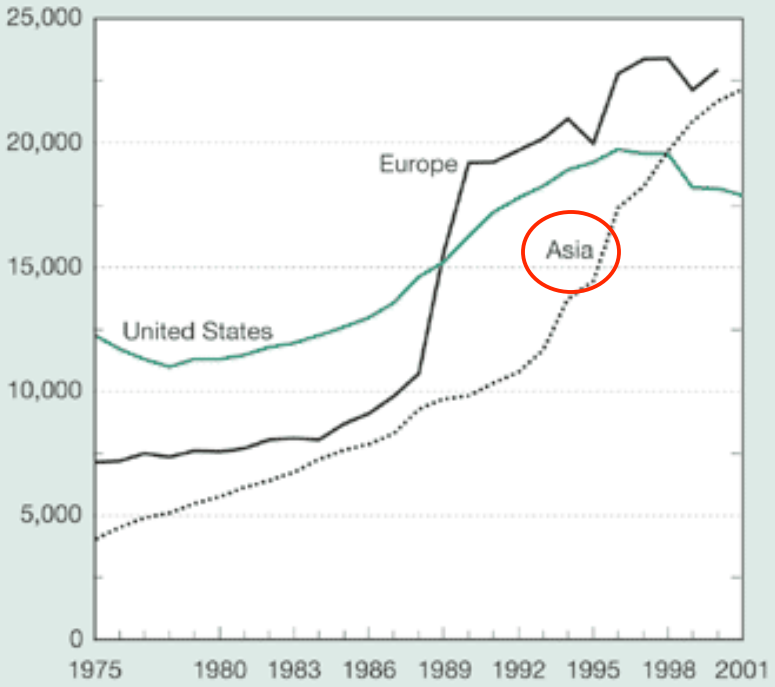


THREE THREATS TO U.S. SCIENCE IN THE FUTURE –ALL OF WHICH ARE 'POLITICAL'

- MONEY TO FUND SCIENCE
- PEOPLE TO DO SCIENCE
- PUBLIC UNDERSTANDING AND TRUST IN SCIENCE

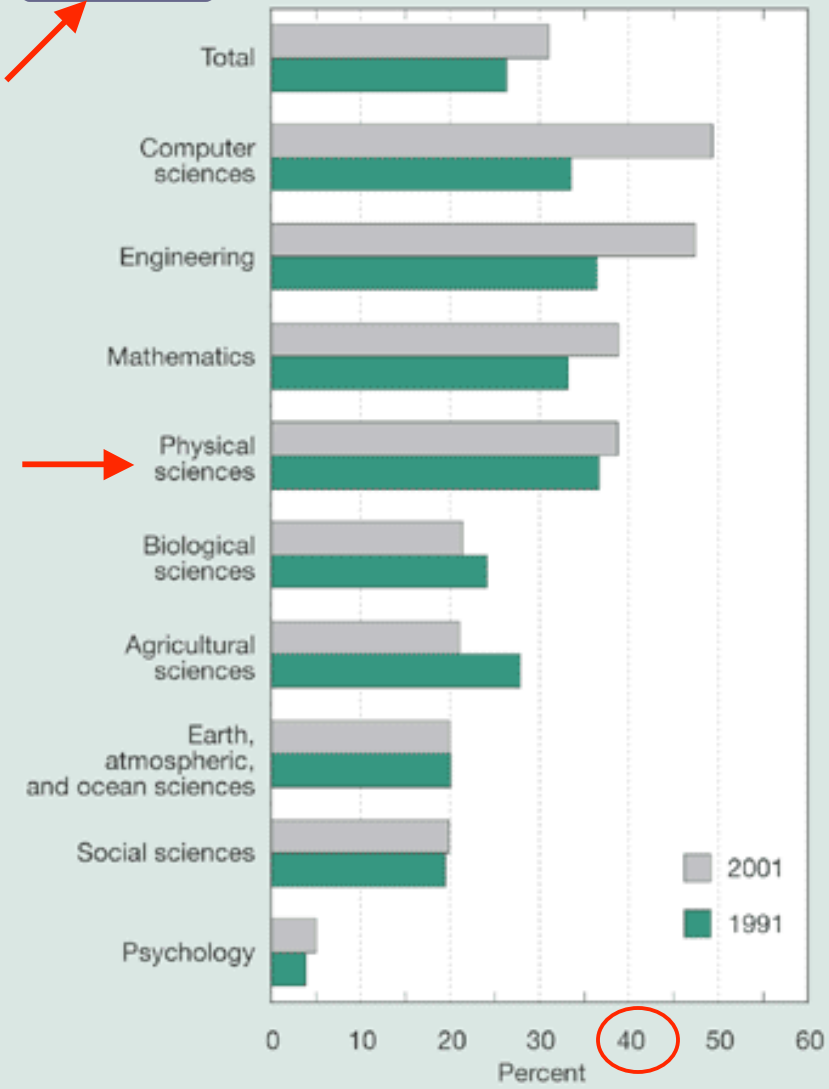
U.S. Graduate Enrollment - Increasingly students came from abroad - but that trend may not continue !

Figure 2-38
NS&E doctoral degrees in United States, Europe, and Asia: 1975–2001



NS&E natural sciences and engineering

Figure 2-8
Foreign student share of U.S. graduate S&E enrollment, by field: 1991 and 2001



SOURCE: National Science Foundation, Division of Science Resources Statistics, WebCASPAR database system, http://caspar.nsf.gov. See appendix table 2-12.

Science & Engineering Indicators – 2004

THREE THREATS TO U.S. SCIENCE IN THE FUTURE –ALL OF WHICH ARE 'POLITICAL'

- MONEY TO FUND SCIENCE
- PEOPLE TO DO SCIENCE
- PUBLIC UNDERSTANDING AND TRUST IN SCIENCE

What Do the American People Know?

(from survey done for NSF's "SE Indicators" *)

- Plants produce oxygen
- Continents have been moving for millions of years
- Light travels faster than sound
- Earth goes around the sun
- Not all radioactivity is manmade

>70%

- Earliest humans did not live with the dinosaurs
- Earth takes one year to go around the sun
- Electrons are smaller than atoms
- Antibiotics do not kill viruses
- Lasers do not work by focusing sound waves

50%

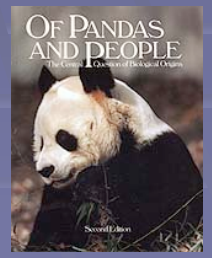
* From NSF (National Science Board) Science and Engineering Indicators 2002, chapt. 7

What Do the American People Believe?

(from various polls reported in NSF's "SE Indicators" *)

- Psychic or spiritual healing - mind over body (> 50%)
- ESP (50%)
- Haunted houses (>40%)
- Ghosts (40%)
- ET visits (>30%)
- Astrology is scientific or "sort of" (40%)
- Evolution in schools
  - teach only evolution (20%)
  - teach with creationism (> 45%)
  - do not teach evolution at all (16%)

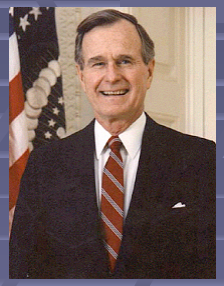
} > 60%



* From NSF (National Science Board) Science and Engineering Indicators 2002, chapt. 7

IGNORANCE THREATENS THE INTEGRITY OF SCIENCE

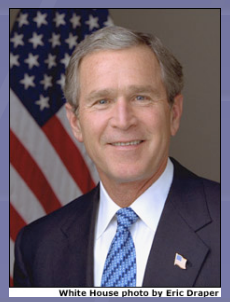
- The integrity of U.S. science has always been non-partisan



"Science, like any field of endeavor, relies on freedom of inquiry; and one of the hallmarks of that freedom is objectivity. Now, more than ever, on issues ranging from climate change to AIDS research to genetic engineering to food additives, government relies on the impartial perspective of science for guidance."

President George H.W. Bush, April 23, 1990

- But something has changed:

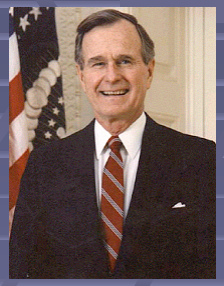


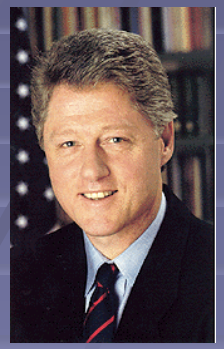
A Statement – "Restoring Scientific Integrity in Policymaking", calling attention to misrepresentation and misuse of science by some in the current Administration, was signed by 62 scientists, including many Nobel Laureates.

Union of Concerned Scientists
Citizens and Scientists for Environmental Solutions

IGNORANCE THREATENS THE INTEGRITY OF SCIENCE

- The integrity of U.S. science has always been non-partisan

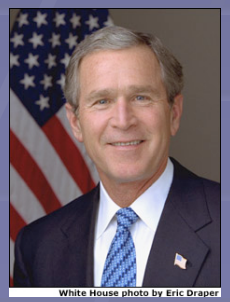




"Science, like any field of endeavor, relies on freedom of inquiry; and one of the hallmarks of that freedom is objectivity. Now, more than ever, on issues ranging from climate change to AIDS research to genetic

Scientific knowledge is not simply a matter of opinion.

- But



A Statement **–** "Restoring Scientific Integrity in Policymaking", calling attention to misrepresentation and misuse of science by some in the current Administration, was signed by 62 scientists, including many Nobel Laureates.

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THREE THREATS TO U.S. SCIENCE IN THE FUTURE –ALL OF WHICH ARE 'POLITICAL'

- MONEY TO FUND SCIENCE
- PEOPLE TO DO SCIENCE
- PUBLIC UNDERSTANDING AND TRUST IN SCIENCE

THREE THREATS TO U.S. SCIENCE IN THE FUTURE
–ALL OF WHICH ARE 'POLITICAL'

- MONEY TO FUND SCIENCE
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- PUBLIC UNDERSTANDING AND TRUST IN SCIENCE

WE SHOULD ADD AN IMPORTANT FOURTH CHALLENGE
–PARTICULARLY DIFFICULT IN A POST 9/11 WORLD

- INTERNATIONAL COOPERATION IN SCIENCE

OUTLINE

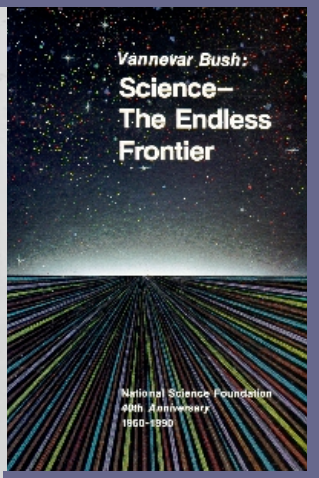
- A personal journey
- U.S. science and technology
- A few policy concerns
- **What lies ahead?**

The end of an era?

Vannevar Bush and the Partnership





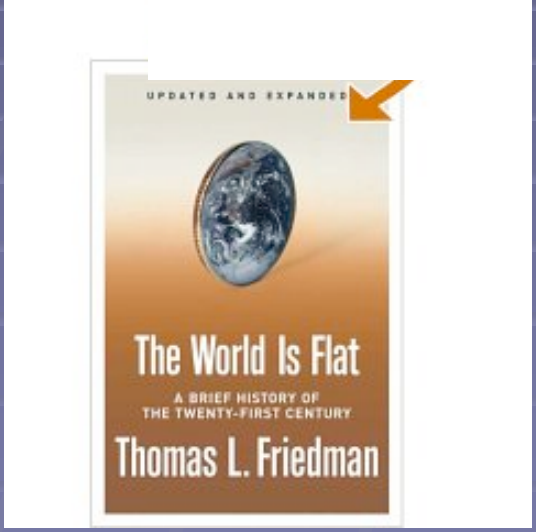


The world has changed since 1945 !

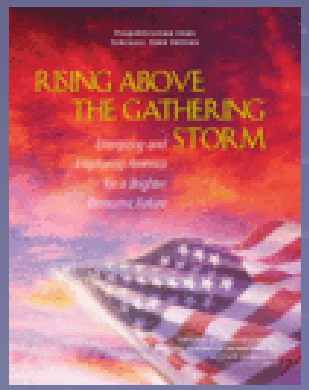
- American universities have changed
  - MIT, Stanford and others trying to replicate them
  - Issues: intellectual property, conflict of interest, money
- U.S. government concerns have changed
  - Cold war is over, but threats remain
  - Confusion over domestic vs. foreign affairs
  - OIL and the Middle East – U.S. energy independence?
- American Industry is now a powerful third partner – but it has powerful foreign competition – U.S. competitiveness?

WHAT LIES AHEAD ?

Three recent documents are relevant



Tom Friedman



Norm Augustine et.al.

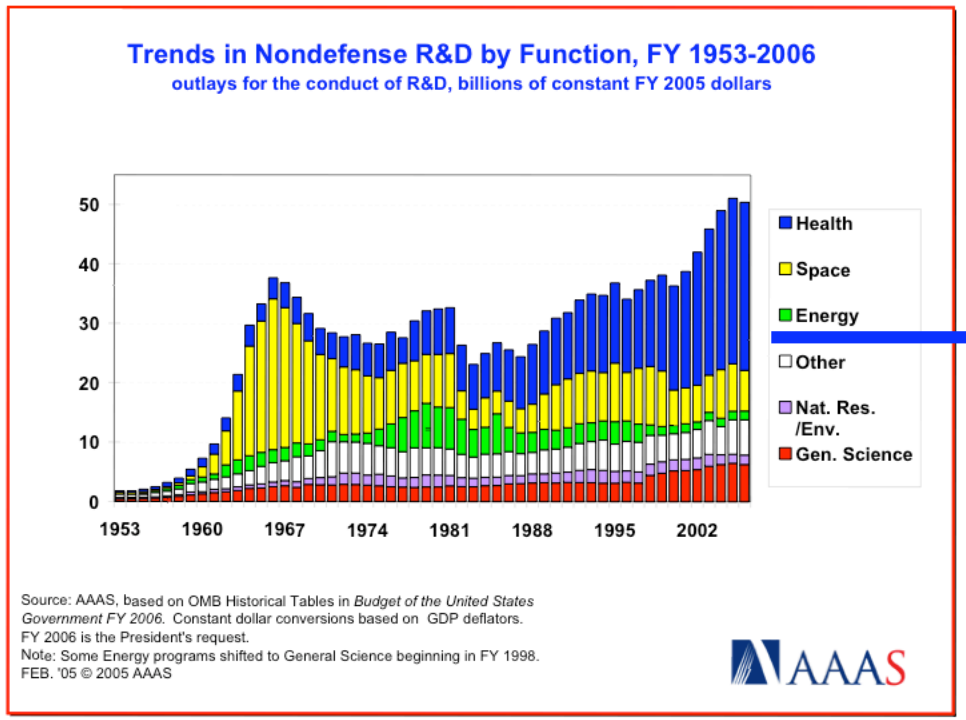
FY2007 Request

WHAT LIES AHEAD ?

From the age of Space to the age of Medicine……

to the age of Energy?
to the age of Competitiveness?
to the age of Knowledge?

} physics ?



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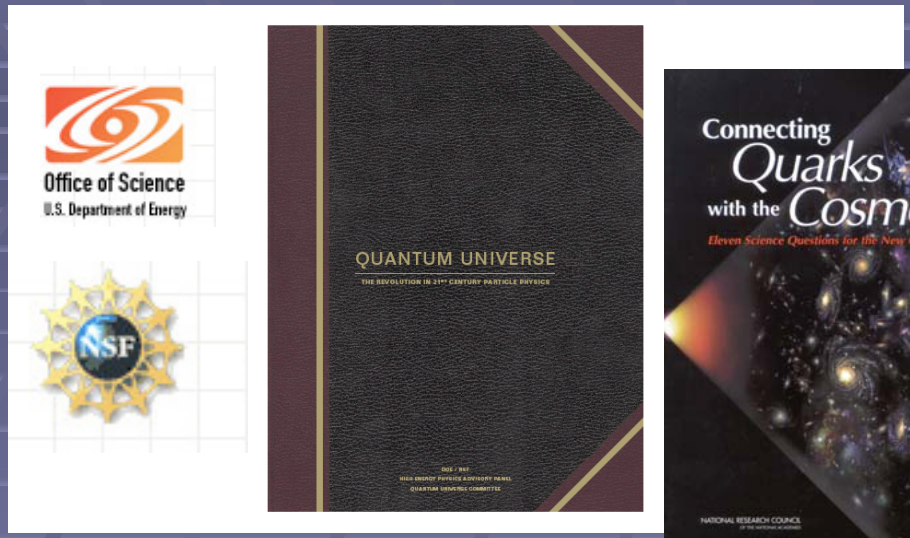
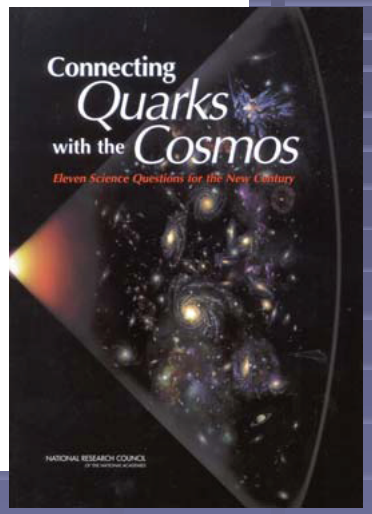
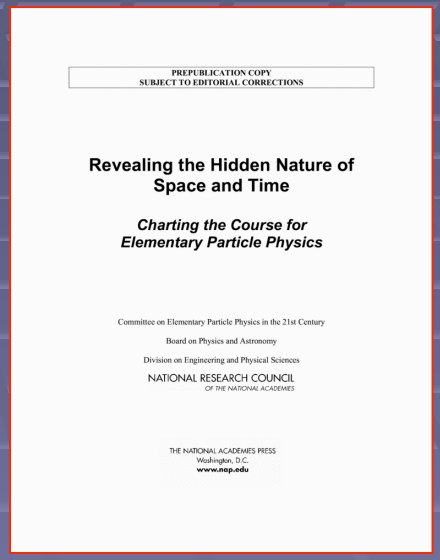
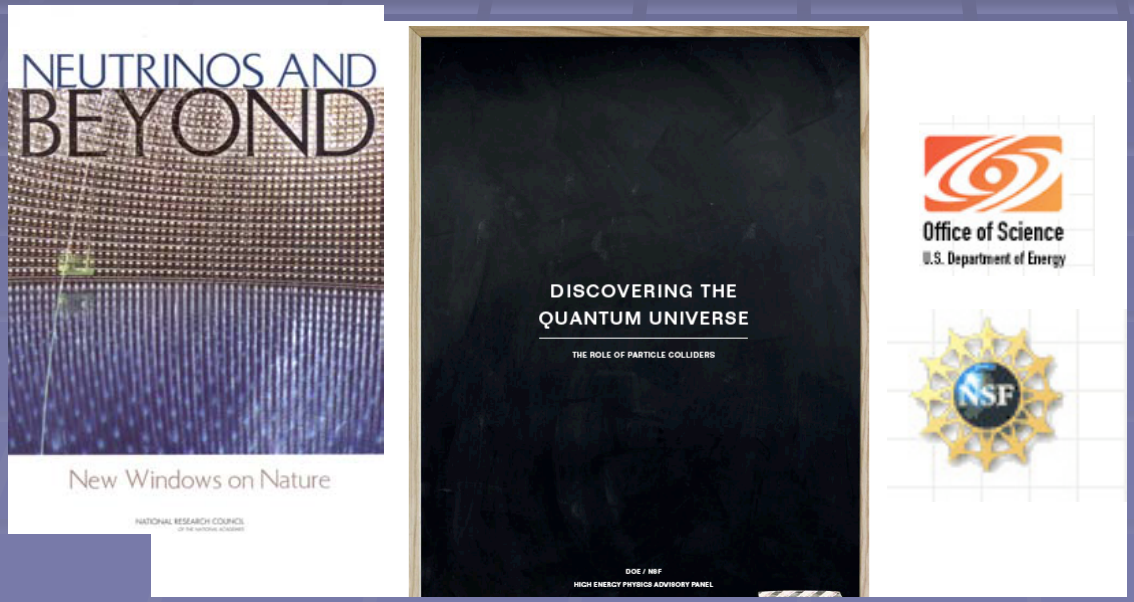
What lies ahead for EPP? – yet another report!







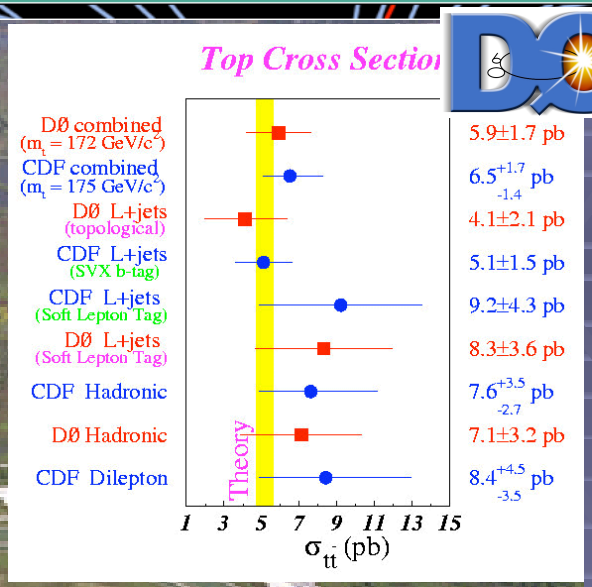


EPP 2010
Shapiro
Dawson

Fermilab

about Fermilab

THE COLLIDER DETECTOR AT FERMILAB



CMS

LARP

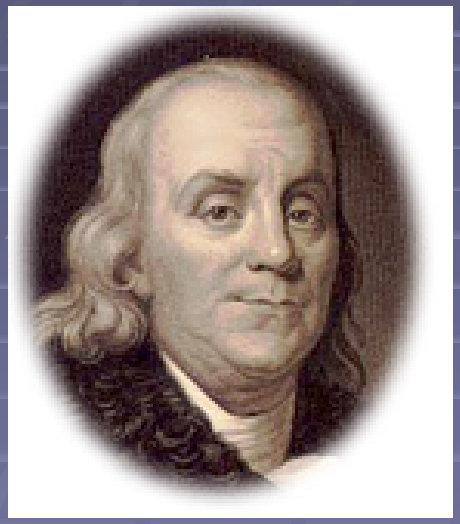
SDSS

Main Injector Neutrino Oscillation Search

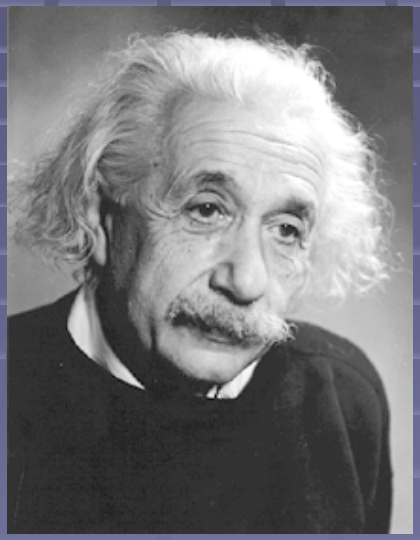
BooNE

The Future of American Science (including EPP) –to Follow or to Lead?

Three American "Civic Scientists"

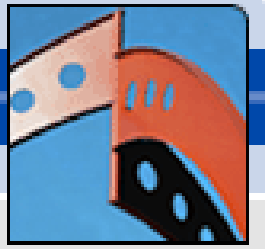


Benjamin Franklin
1706-1790



Albert Einstein
1879-1955

Allan Bromley
1926-2005



Thank you !